

INTERCONNECTING METHOD OF WIRING IN PRINTED CIRCUIT BOARDS  
AND PRINTED CIRCUIT BOARD UNIT

BACKGROUND OF THE INVENTION

5 Field of the Invention

The present invention relates generally to an electrical equipment. More particularly, the invention relates to a method for connecting wiring, such as power source lines, signal lines and so forth of a plurality of printed circuit boards with each other and a printed circuit board unit with a plurality of printed circuit boards established connection.

Description of the Related Art

In the conventionally realized printed circuit board unit, a main board 51 and a subsidiary board 52 are connected through a connector 53 and a connector 54, and the main board 51 and the subsidiary board 52 are secured by a screw 55 so as to prevent disengagement of the connectors 53 and 54 as shown in terms of an example of personal computer in Figs. 6A and 6B. In the shown personal computer, a power source current 56 flowing out from a power source IC 60 of the subsidiary board 52 flows into a load circuit A61 on the subsidiary board 52 through a power source pattern 57 and to a pin 59 of the connector 53, as shown in Figs. 7A and 7B. The current flowing into the pin 59 is supplied into a load circuit B62 and a load circuit C63 by a power source pattern 58 of the main board 51 through the connector

53 and the connector 54. In these figures, only connection of the power source lines is illustrated. However, the signal lines are connected through the connectors in similar manner as the power source lines.

5 In the conventional printed circuit board unit set forth above, the power source lines and the signal lines used in common in the subsidiary board and the main board are connected only by the connectors. Number of pins in the connector becomes larger to require greater space.

10 SUMMARY OF THE INVENTION

The present invention has been worked out in view of the problem set forth above. Therefore, it is an object of the present invention to provide a printed circuit board unit which has smaller number of pins in connectors for connection of wiring  
15 (signal lines and power source lines) between a plurality of printed circuit boards for increasing mounting space of the board and interconnection method of wiring between printed circuit boards.

According to one aspect of the present invention, an  
20 interconnection method of wiring of printed circuit boards for interconnecting wiring of a plurality of printed circuit boards of electrical equipment, comprises:

step of electrically connecting a part of wiring of the printed circuit boards with each other by connectors; and  
25 step of electrically connecting remaining portion of

wiring of the printed circuit boards with each other by a screw formed of an electrically conductive body in conjunction with fixing the printed circuit boards by the screw.

According to another aspect of the present invention,  
5 a printed circuit board unit comprises:

a plurality of printed circuit boards having wiring formed thereon;

a part of the wiring on the printed circuit boards electrically connected through connectors;

10 a screw formed of electrically conductive body and fixing the plurality of printed circuit boards with preventing the connectors from disengaging from each other; and

remaining part of the wiring on the printed circuit boards electrically connected through the screw.

15 In practice, power source lines and/or signal lines of the printed circuit boards are electrically connected with each other by the screw.

With the present invention, the screw for fixing a plurality of printed circuit boards is used as a part of wiring  
20 to reduce number of pins of the connectors to increase mounting space on the printed circuit board.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood more fully from the detailed description given hereinafter and from the  
25 accompanying drawings of the preferred embodiment of the present

invention, which, however, should not be taken to be limitative to the invention, but are for explanation and understanding only.

In the drawings:

5        Fig. 1 is a flowchart of one embodiment of an interconnection method of wiring on printed circuit boards according to the present invention;

Fig. 2A is a front elevation of the first embodiment of a printed circuit board unit according to the present invention;

10       Fig. 2B is an enlarged perspective view of the first embodiment of a printed circuit board unit according to the present invention;

Fig. 3A is a plan view of a subsidiary board 2 of Fig. 2B;

15       Fig. 3B is a plan view of a main board 1 of Fig. 2B;

Fig. 4A is a front elevation of the second embodiment of a printed circuit board unit according to the present invention;

20       Fig. 4B is an enlarged perspective view of the second embodiment of a printed circuit board unit according to the present invention;

Fig. 5A is a plan view of a subsidiary board 36 of Fig. 4A;

25       Fig. 5B is a plan view of a subsidiary board 32 of Fig. 4A;

Fig. 5C is a plan view of a main board 1 of Fig. 4A;

Fig. 6A is a plan view of the prior art;

Fig. 6B is an enlarged perspective view of Fig. 6A;

Fig. 7A is a plan view of a subsidiary board of Fig. 6A;

5 and

Fig. 7B is a plan view of a main board of Fig. 6A.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention will be discussed hereinafter in detail in terms of the preferred embodiment of the present invention with reference to the accompanying drawings. In the following description, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be obvious, however, to those skilled in the art that the present invention may be practiced without these specific details. In other instance, well-known structure are not shown in detail in order to avoid unnecessary obscurity of the present invention.

Fig. 1 is a flowchart of one embodiment of connection method according to the present invention.

20 As shown in Fig. 1, in one embodiment of the connection method according to the present invention, electrical interconnection of wiring of a plurality of printed circuit boards, namely a part of power source lines and signal lines, is established by connectors (step 1). Next, for preventing  
25 the connectors from disengaging, the printed circuit boards

are fixed with each other by screw (step 2). Here, by using the screw formed of electrically conductive material, such as metal including, copper, aluminum or the like, remaining part of the power source lines and the signal lines of the printed  
5 circuit boards are electrically connected by the electrically conductive screw (step 3).

Fig. 2A is a front elevation of the first embodiment of a printed circuit board unit according to the present invention, Fig. 2B is an enlarged perspective view of the first embodiment  
10 of a printed circuit board unit according to the present invention, Fig. 3A is a plan view of a subsidiary board 2 of Fig. 2B, and Fig. 3B is a plan view of a main board 1 of Fig. 2B.

In the shown printed circuit board unit, two printed circuit boards are electrically connected by the method shown  
15 in Fig. 1.

Namely, as shown in Figs. 2A and 2B, in the printed circuit board unit, connectors 3 and 4 are disposed between a main board 1 and a subsidiary board 2, and the main board 1 and the subsidiary board 2 are fixed with each other by a screw 5. The screw 5  
20 is formed of electrically conductive body. In the shown embodiment, the screw 5 is formed of copper. On the main board 1 and the subsidiary board 2, a load circuit B10, a load circuit C11, a power source IC 8 and a load circuit A9 are formed as shown in Figs. 3A and 3B, respectively. The connectors 3 and  
25 4 are used for connection of wiring of other load circuits and

so forth (not shown). The screw 5 is used for preventing the connectors 3 and 4 from causing disengagement and thus maintains the main board 1 and the subsidiary board 2 in fixed condition. Also, the screw 5 serves as the power source line for connection  
5 between the power source IC 8 and the load circuits B10 and C11. Namely, the power source current 7 flowing from the power source IC 8 of the subsidiary board 2 flows into the load circuit A9 and the screw 5 via the power source pattern 12 as the power source line. The power source current 7 flowing in the screw  
10 5 flows into the load circuit B10 and the load circuit C11 through the power source pattern 13 of the main board 1. The screw 5 and the power source patterns 12 and 13 are electrically connected upon fastening by the screw.

In the printed circuit board unit shown herein, only power  
15 source line is electrically connected by the screw 5. However, it is also possible to electrically connect the signal lines by another screw for fixing the main board 1 and the subsidiary board 2.

As set forth above, since the power source lines from  
20 the power source IC and/or the signal lines are electrically connected by the screw, number of pins of the connectors can be reduced in comparison with the case where the power source lines and the signal lines on the printed circuit boards are connected by only connectors as in the prior art.

25 Fig. 4A is a front elevation of the second embodiment

of a printed circuit board unit according to the present invention,  
Fig. 4B is an enlarged perspective view of the second embodiment  
of a printed circuit board unit according to the present invention,  
Fig. 5A is a plan view of a subsidiary board 36 of Fig. 4A,  
5 Fig. 5B is a plan view of a subsidiary board 32 of Fig. 4A,  
and Fig. 5C is a plan view of a main board 1 of Fig. 4A.

As shown in Figs. 4A to 5C, the second embodiment of the  
printed circuit board unit is constructed with three printed  
circuit boards, namely a main board 31 and two subsidiary boards  
10 32 and 36. Between the main board 31 and the subsidiary board  
32, connectors 33 and 34 are disposed. Also, between the  
subsidiary board 32 and the subsidiary board 36, connectors  
38 and 39 are disposed. Also, the main board 31 and the subsidiary  
boards 32 and 36 are fixed by means of a screw 35. Here, the  
15 screw 35 is formed of electrically conductive body (in this  
case, aluminum). On the other hand, a power source IC 43 and  
load circuits 41, 42, 44, 45 and 46 formed on the main board  
31 and the subsidiary boards 32 and 36 are electrically connected  
by the screw 35 via power source patterns 47, 48 and 49. The  
20 power source IC and the load circuits (both are not shown) except  
for the power source IC 43 and the load circuits 41, 42, 44,  
45 and 46 are electrically connected by the connectors 33, 34  
and 38, 39. On the other hand, while not illustrated, the signal  
lines may also be electrically connected by the screw in similar  
25 manner as the power source lines.



Even in the shown embodiment of the printed circuit board unit, the power source lines from the power source IC is connected by the screw 35 and the signal lines are also connected through the screw. Therefore, number of pins of the connector can be  
5 reduced in comparison with the case where the wiring on the printed circuit boards are connected only by the connectors as in the prior art, to contribute for increasing of mounting space on the printed circuit board.

As set forth above, with the present invention, by  
10 establishing electrical interconnection of wiring on the printed circuit board by the screw formed of electrically conductive body which fixes the printed circuit board with each other, number of pins of the connectors for interconnection of wiring of the printed circuit boards can be reduced to  
15 contribute for increasing of mounting space on the printed circuit board.

Although the present invention has been illustrated and described with respect to exemplary embodiment thereof, it should be understood by those skilled in the art that the  
20 foregoing and various other changes, omission and additions may be made therein and thereto, without departing from the spirit and scope of the present invention. Therefore, the present invention should not be understood as limited to the specific embodiment set out above but to include all possible  
25 embodiments which can be embodied within a scope encompassed

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